



Original Article

Impact of Climatic Variations on Grapes Cultivation: A Case Study of Tasgaon Tehsil in Sangli District (Maharashtra)

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Abstract

Agriculture is the mainstay of more than 45 per cent peoples inhabited in India. The proportion of fruit-farming in Sangli district is consistently increasing since 2001-02. In the present study researchers have attempted to investigate the impact of changing climatic condition on grapes cultivation in Tasgaon tehsil in Sangli district, a region famous for its high-quality grapes production in Maharashtra. For the present study secondary data is collected from five representative villages i.e. Dahivadi, Manerajuri, Dongarsoni, Savlaj and Bhose regarding the impact of climatic variations on the cultivation of grapes. The study highlights on even though Tasgaon tehsil experiences an ideal geographical condition for grapes, then recurrent droughts and temperature fluctuations necessitates robust agricultural insurance awareness (currently at 59.2%) and continued expert guidance for sustainable production.

Keywords: Climate Change, Grapes Cultivation, Water Scarcity and Adaptation Strategies.

Introduction

The study highlights that changing climatic condition including water insufficiency, unseasonal rainfall, storms, extreme temperatures, and droughts have significantly affects the grape cultivation. These changes distress both the yield and the quality grapes. High temperature and lack of water cause specifically the physiological stress on the grape vines. Tasgaon tehsil in the Sangli district of Maharashtra is a renowned hub for grape production. However, because it falls within a "scarcity zone" (agro-climatic zone), it is highly vulnerable to climatic shifts. Recently, it has been observed that recurrent droughts are forcing farmers to replace grape areas with other crops.

Study Area

Region and Location: Sangli district lies in the southern part of Maharashtra having 10 tehsils and covering an area of about 8,572 Sq. KM. Tasgaon tehsil occupies the central part of the district. Geographically this tehsil is located at coordinates 17° 03' North Latitude and 74° 6' East Longitude. Tasgaon tehsil is extended over 907.2 sq.km. area. It is a well-known region in Maharashtra to produce grapes. As per the census of 2011, there are 68 villages in Tasgaon tehsil and out of them Dahivadi, Manerajuri, Dongarsoni, Savlaj and Bhose are selected for the present study. These villages are significantly engaged in grapes cultivation. Agro-Climatic Context: The area has historically experienced a rise in maximum temperature (up to 0.98°C between 1901 and 2013). In recent years, it has frequently fallen victim to changing climatic conditions, specifically a high frequency of droughts. The researchers have selected this specific area because it is classified as a scarcity zone (agro-climatic zone) and an attempt has been made to investigate how grapes cultivation is affected by this climatic condition.

Objectives

- To analyse the impact of specific climatic variations on different growth stages of grapes.
- To evaluate the adaptation strategies and measures adopted by grape farmers to mitigate the effects of climate change.

Data Base & Research Methodology

The researchers have utilized a combination of primary and secondary data sources.

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Primary Data: - The core of the study is based on extensive fieldwork conducted in February 2025. This includes a sample survey of 125 grape farmers.

Secondary Data: - The researchers have referred socioeconomic abstract, climatic data on temperature and rainfall trends and agricultural census. The study employs a systematic geographical and statistical approach. Tasgaon

Garrett's Ranking Technique is applied to rank climatic factors based on the scores provided by the farmers (e.g., Water Scarcity was ranked 1st). Statistical data is analysed and presented using percentages and tabulation to show the correlation between climatic conditions and crop stages. Field observations done by the researchers have visualized through "Photo Plates" (visual documentation) to record actual crop damage caused by water scarcity, high temperatures, and unseasonal rainfall.

Climate Change and Its Impact on Grapes Cultivation in Tasgaon tehsil

The impact of changing climatic conditions such as insufficiency of water, unseasonal rainfall, storms, cold climate, high temperatures, heat and drought have affected on grape cultivation and also climatic changes distress yield and quality of grapes. The high temperatures and lack of water cause stress on the plant, which can affect the grapes

drop. The same conditions is observed in sample survey. The grape farmers also ranked the identified six factors in table 1.

Table 1
Impact of Climatic Factors on Grapes in Tasgaon Tehsil (2025)

Sr. No.	Particulars	Garrett's Scores	Rank	Percentage
1	Water Scarcity	7771	1	17.86
2	Climatic Diseases	7456	2	17.14
3	Unseasonal Rainfall	7205	3	16.56
4	High Temperature	7122	4	16.37
5	Frost Condition	6980	5	16.05
6	Storm	6966	6	16.01

Source: Based on the Field Work, February 2025

It is found that, 17.89 per cent grape farmers chose water scarcity is the first position as a climatic factor affecting on grapes cultivation. Climatic changes also observed through pests and diseases, such as parasites and fungi (e.g. mildew) on plants. Climatic diseases ranked on second place with 17.14 per cent farmers views and third rank by unseasonal rainfall reported by 16.56 per cent respondents. There are 16.37 per cent farmers have assigned fourth rank to high temperature. 16.05 per cent farmers (12 %) gave fifth rank to frost condition which makes impact on grapes cultivation, whereas 16.01 per cent farmers kept storm at sixth rank.

Impact of Climatic Condition on the Growth Stages of Grapes

According to chapter-III, climate of study area reveals a rise in maximum temperature up to 0.98 °C during 1901 to 2013. Its results are earlier harvest. The number of

tehsil is selected due to its status as a major grapes-producing region located in a scarcity-prone agro-climatic zone. Five specific villages- Dahivadi, Manerajuri, Dongarsoni, Savlaj, and Bhoose—are chosen for the study. A total of 125 farmers were surveyed to represent the local population.

production (Delay, 2015). Tasgaon tehsil in Sangli district is well-known in Maharashtra for the production of grapes. Therefore, researcher have selected Tasgaon tehsil on the basis of scarcity zone (agro-climatic zone) for the present work to highlight the impact of climate on grapes cultivation. For this purpose, researchers have selected five villages i.e. Dahivadi, Manerajuri, Dongarsoni, Savlaj and Bhoose. In the recent past, grape crop frequently become a victim of changing climatic conditions (frequency of droughts) and noticeably observed that most of the area under grape is replaced by the other crops.

Unfavourable Climatic Conditions in Grapes Cultivation

Increased temperature, both minimum and maximum, effects the growth of grapes i.e. crop dryness and crop

flowers per inflorescence and on the number of inflorescences per shoot relation with this happen climatic condition can affect both variables. Indeed, it has been demonstrated that the higher the temperatures around budburst, the lower the number of flowers per inflorescence (Keller, 2010). There are mainly four stages of grapes viz. bud break, flowering, fruit set and mature stages (Table 2). There are 13.60 per cent farmers having grapes farm in the choosen area, continuous rain and water scarcity are unfavourable conditions for grape at bud break stage.

It is observed that 35.00 per cent farmers noticed that cold temperature, rainfall, cloud and fog conditions adversely affects grape in its flowering stage which ultimately results seen through low quality and poor yield. 26.40 per cent cultivators eagerly noticed that during the fruit set stage of grapes high temperature and rainfall remarkably affects its yield. As far as mature stage of grapes

is concerned, 24.00 per cent farmers are reported that water scarcity, high temperature, rainfall, storm and hail conditions highly affects in the form of damage and grapes production.

Impact of climate is clearly seen on grapes i.e. from bud break stage to maturity stage. During the flowering stage of grapes, if cold climate, fog and rainfall occur then flowers and leaves are damages.

At fruit-set stage, climatic condition like rise in temperature and rainfall highly affects on the product breaks in different forms. Stormy rain and high temperature in maturity stage of grapes is also harmful to grape crop. But at bud break stage requires water. It is found that this crop highly damaged by scarcity of water during the stage of bud-break (Plate 1).

Table 2
Impact of Climatic Conditions on Stages of Grapes (2025)

Sr. No.	Crop Stages	Climatic Condition	No. of Respondents	Respondents in per cent
1	Bud Break	Continuous rainfall	8	6.40
		Water scarcity	9	7.20
2	Flowering	Cold Temperature	15	12.00
		Cloud and fog	13	10.40
		Rainfall	17	13.60
3	Fruit set	High Temperature	14	11.20
		Rainfall	19	15.20
4	Mature	Water scarcity	9	7.20
		High Temperature	6	4.80
		Storm and Hail	5	4.00
		Rainfall	10	8.00
Total			125	100.00

Source: Based on the Field Work, February 2025

Adaptation of Grapes Farmers to Change Climatic Conditions

A grape crop requires assured irrigation facilities, and it highly becomes a victim of adverse climatic conditions. Tasgaon tehsil in Sangli district has ideal climatic condition for this crop and it is observed that nearly all cultivators

using HYV's. It is found that out of 125 farmers 82.40 per cent have changed the method to taking grapes crop. It is also found that only 25 per cent farmers have changed its sowing and harvesting period and 61.60 per cent have changed daily schedule of working hours and 59.20 per cent farmers are aware about crop insurance.

Table 3
Adaptation of Grape Farmers to Changing Climatic Conditionin Tasgaon Tehsil (2025)

Sr. No.	Adaptation Measures For Grapes Crop	Yes		No	
		No.	%	No.	%
1	Shifting of Cropping Pattern	103	82.40	22	17.60
2	Changes in Sowing Season	27	21.60	98	78.40
3	Changes in Harvesting Season	31	24.80	94	75.20
4	Change in Timing of Agricultural Labour	77	61.60	48	38.40
5	Suitability of Grapes Crop	69	55.20	56	44.80
6	Awareness of Agricultural Insurances	74	59.20	51	40.80
7	High Yielding Varieties	122	97.60	03	2.40
8	Fertilizer, Insecticides and Pesticides	125	100.00	00	0.00
9	Advanced irrigation Techniques	125	100.00	00	0.00
10	Proper Guideline of Crop Cultivation	113	90.40	12	9.60

Source: Based on the Field Work, February 2025

A grape crop is long termed crop, so, it needs continuous artificial water supply or irrigation facilities. It is significant to note that 100 per cent respondent uses drip irrigation system to be watering the crop. It is found that all farmers are applied fertilizers and pesticides for this crop. It is also

observed that 90.40 per cent respondent have got proper guidance from the experts. Extreme weather conditions especially drought, flood and storm highly affects grapes cultivation in the study area. The impact of drought condition seen on almost all crops.



Impact of Water Scarcity on Grapes
at Bud Break Stage



Impact of Insufficient Water
Available on Grapes at Fruit Set Stage



An Impact of High Temperature on
Grape at Fruit Set Stage



Unseasonal Rainfall Destroy Grapes
at Mature Stage

Photo Plate 1

Conclusion

Climate change has become a significant threat to the sustainability of grape farming in Tasgaon Tehsil of Sangli district. Even though the region remains a vital hub for grape production in Maharashtra, the increasing frequency of adverse climatic events is negatively affecting both the quantity and quality of the yield. Water scarcity is identified as the most critical factor (ranked 1st), followed by climatic diseases and unseasonal rainfall regarding grapes cultivation. These factors have forced some farmers to replace grape areas with other crops. Climatic variations affect grapes at every growth stage. High temperature and rain are particularly damaging during the "Fruit Set" stage, while cold temperatures and fog adversely affect "Flowering". Increased temperatures have led to "crop dryness" and "crop drop," as well as shifts in harvesting periods. Farmers are actively responding to these changes, with 100% of surveyed cultivators adopting drip irrigation and intensive use of fertilizers and pesticides. It is found that, over 82% of farmers have shifted their cropping patterns and a majority (61.6%) have had to change the daily timing of agricultural labour due to changing weather conditions. The researchers have found that while adaptation measures like high-yielding varieties and expert guidance are high (over 90%), there is still a need for greater awareness regarding agricultural insurance (currently at 59.2%) to protect farmers against the extreme weather risks of drought, floods, and storms.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

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